

WHAT IS CLAIMED IS:

1 1. A disk drive controller that corrects multiple burst errors in data bytes, the
2 disk drive controller comprising:
3 a first level decoder; and
4 a second level decoder that uses block level check bytes to detect columns in a
5 two-level block structure of data bytes containing burst errors,
6 wherein the second level decoder generates erasure pointers that identify the
7 columns in the two-level block structure containing the burst errors,
8 the first level decoder uses codeword check bytes in the two-level block structure
9 to correct all of the data bytes in the columns identified by the erasure pointers, and
10 the first level decoder does not use any of the codeword check bytes for error
11 location calculations.

1 2. The disk drive controller according to claim 1 wherein the first level
2 decoder is configured to detect and correct random errors in the two-level block structure of data
3 bytes using the codeword check bytes.

1 3. The disk drive controller according to claim 2 wherein the second level
2 decoder uses the block level check bytes to correct random errors in a codeword if the first level
3 decoder does not correct all of the random errors, and
4 the second level decoder only generates the erasure pointers if the first level and
5 the second level decoders do not correct all of the random errors.

1 4. The disk drive controller according to claim 1 wherein the disk drive
2 controller de-interleaves the two level block structure of data bytes to separate out the data bytes,
3 the block level check bytes, and the codeword check bytes.

1 5. The disk drive controller according to claim 1 wherein the disk drive
2 controller generates syndromes that are used for error correction for the data bytes in the two-
3 level block structure.

1 6. The disk drive controller according to claim 1 wherein two-level block
2 structure of data bytes is applied to an inverse of an integrating matrix V^{-1} to redistribute the data
3 bytes, the codeword check bytes, and the block level check bytes.

1 7. The disk drive controller according to claim 1 wherein the first and the
2 second level decoders are Reed-Solomon decoders.

1 8. The disk drive controller according to claim 1 wherein the disk drive
2 controller includes an ECC read processor and an ECC write processor.

1 9. A disk drive system that corrects multiple burst errors in data bytes, the
2 disk drive system:

3 a disk assembly comprising a disk and a head stack assembly that includes a
4 spindle motor; and

5 a disk drive controller chipset that includes first level and second level decoders,
6 wherein the second level decoder uses block level check bytes to detect columns
7 in a two-level block structure of data bytes that contains burst errors,

8 the second level decoder generates erasure pointers that identify the columns in
9 the two-level block structure containing the burst errors, and

10 the first level decoder uses codeword check bytes in the two-level block structure
11 to correct all of the data bytes in the columns identified by the erasure pointers.

1 10. The disk drive system according to claim 9 wherein the first level decoder
2 does not use any of the codeword check bytes for error location calculations, and the first level
3 decoder uses all of the codeword check bytes used for error value calculations.

1 11. The disk drive system according to claim 10 wherein the first level
2 decoder is configured to detect and correct random errors occurring in the data bytes using the
3 codeword check bytes before the second level decoder is used to detect the burst errors.

1 12. The disk drive system according to claim 11 wherein the second level
2 decoder uses the block level check bytes to correct random errors in a codeword if the first level
3 decoder does not correct all of the random errors.

1 13. The disk drive system according to claim 9 wherein the disk drive
2 controller chipset de-interleaves the two level block structure of data bytes to separate out the
3 data bytes, the block level check bytes, and the codeword check bytes.

1 14. The disk drive system according to claim 9 wherein the disk drive
2 controller chipset generates syndromes for codewords in the two-level block structure.

1 15. The disk drive system according to claim 9 wherein the disk drive
2 controller chipset includes an ECC read processor and an ECC write processor.

1 16. The disk drive system according to claim 9 wherein the first and the
2 second level decoders are Rood-Solomon decoders.

1 17. The disk drive system according to claim 9 wherein two-level block
2 structure of data bytes is applied to an inverse of an integrating matrix V^{-1} to redistribute the data
3 bytes, the codeword check bytes, and the block level check bytes.